

Memorandum

TO: Nick Brand

FROM: James Johnson, Michael Snavelly, Rachel Copperman, Yushuang Zhou,
and George Mazur

DATE: August 17, 2010

RE: Alternative Station Configurations in San Diego County - FINAL

Three year 2030 Full System scenarios were modeled to test alternative station locations in San Diego County. Each scenario included the same overall level of high-speed rail (HSR) operations featured in the May 2009 operating plan, and the higher station parking rates included in the *Increased Parking Cost Scenario*. These alternatives test the effects of:

- Replacing both the downtown San Diego terminal (Santa Fe Depot) and University City (UTC) terminals with a new alignment and single stop at Qualcomm Stadium (*Qualcomm Terminus Scenario*);
- Replacing Santa Fe Depot with a stop at Lindbergh Field along the base alignment (*Lindbergh Terminus Scenario*); and
- Replacing both Santa Fe Depot and the UTC stop with a single terminus at Lindbergh station (*Lindbergh Terminus Without UTC Scenario*).

Figure 1 displays the HSR alignments and station alternatives within San Diego County.

Operating Plans

The *Qualcomm Terminus Scenario* operating plan (see Table 1) is identical to the *Increased Parking Cost Scenario*, with the exception that the UTC and Santa Fe Depot stations are replaced by a single Qualcomm terminus on a new alignment accessible via I-15. Travel time to the San Diego terminus decreases by 15 minutes under the new scenario due in part to a more northerly station at Qualcomm Stadium and removal of the UTC stop.

The *Lindbergh Terminus Scenario* operating plan (see Table 2) is identical to the *Increased Parking Cost Scenario*, with the exception that Santa Fe Depot terminus is replaced by Lindbergh Station. Travel time to the San Diego area decreases by four minutes compared to the May 2009 operating plan, because the new station is located further north than Santa Fe Depot.

The *Lindbergh Terminus without UTC Scenario* operating plan (see Table 3) is identical to the *Increased Parking Cost Scenario*, with the exception that the San Diego Lindbergh station replaces both Santa Fe Depot and the UTC station. Since the new station is further north and east than

Figure 1. San Diego County Alignment and Station Alternatives



Table 1. Full System Operating Plan for the Qualcomm Terminus Scenario

Station Pattern #	Run Time from Start Station (Minutes)													
	0	1	2	29	28	4	20	41	42	14	39	25	15	35
San Francisco	0	0	0	0	0	0	0			0	0			
Millbrae					15	15	15			15				
Redwood City/Palo Alto		20		20	25	25	25			25	20			
San Jose		35	30	35	40	40	40			40	35			
Gilroy		51		51	56	56				56				
Merced										91				
Modesto										108				
Stockton										124	104			
Sacramento										146	126	0	0	0
Stockton												22	22	22
Modesto													38	
Merced													55	
Fresno					97	97	93					68	78	68
Bakersfield						138	134						119	
Palmdale				151	164	172						135	153	
Sylmar				173		194	183					157	175	
Burbank						203						166	184	
Los Angeles Union Station	160	175	163	188	198	213	198	0	0			176	194	154
City of Industry				208	218			19						174
Ontario		203		220	230	241		31						186
Riverside		216		233	243	254		44	35					199
Murrieta				250	260			61						216
Escondido				268	278			79						234
San Diego (Qualcomm)		255		280	290	293		91	74					246
Norwalk	173		176				211					189	207	
Anaheim	184		187				222					200	218	
Frequency (trains per hour)	1	2	1	1	1	1	1	1	1	1	1	1	1	1

Note: “|” indicates no station stop for indicated pattern.

Table 2. Full System Operating Plan for the Lindbergh Terminus Scenario

Station Pattern #	Run Time from Start Station (Minutes)													
	0	1	2	29	28	4	20	41	42	14	39	25	15	35
San Francisco	0	0	0	0	0	0	0			0	0			
Millbrae					15	15	15			15				
Redwood City/Palo Alto		20		20	25	25	25			25	20			
San Jose		35	30	35	40	40	40			40	35			
Gilroy		51		51	56	56				56				
Merced										91				
Modesto										108				
Stockton										124	104			
Sacramento										146	126	0	0	0
Stockton												22	22	22
Modesto													38	
Merced													55	
Fresno					97	97	93					68	78	68
Bakersfield						138	134						119	
Palmdale				151	164	172						135	153	
Sylmar				173		194	183					157	175	
Burbank						203						166	184	
Los Angeles Union Station	160	175	163	188	198	213	198	0	0			176	194	154
City of Industry				208	218			19						174
Ontario		203		220	230	241		31						186
Riverside		216		233	243	254		44	35					199
Murrieta				250	260			61						216
Escondido				268	278			79						234
University City (UTC)		258		283	293	296		94						
San Diego (Lindbergh)		266		291	301	304		102	81					257
Norwalk	173		176				211					189	207	
Anaheim	184		187				222					200	218	
Frequency (trains per hour)	1	2	1	1	1	1	1	1	1	1	1	1	1	1

Note: “|” indicates no station stop for indicated pattern.

Table 3. Full System Operating Plan for the Lindbergh Terminus Without UTC Scenario

Station Pattern #	Run Time from Start Station (Minutes)													
	0	1	2	29	28	4	20	41	42	14	39	25	15	35
San Francisco	0	0	0	0	0	0	0			0	0			
Millbrae					15	15	15			15				
Redwood City/Palo Alto		20		20	25	25	25			25	20			
San Jose		35	30	35	40	40	40			40	35			
Gilroy		51		51	56	56				56				
Merced										91				
Modesto										108				
Stockton										124	104			
Sacramento										146	126	0	0	0
Stockton												22	22	22
Modesto													38	
Merced													55	
Fresno					97	97	93					68	78	68
Bakersfield						138	134						119	
Palmdale				151	164	172						135	153	
Sylmar				173		194	183					157	175	
Burbank						203						166	184	
Los Angeles Union Station	160	175	163	188	198	213	198	0	0			176	194	154
City of Industry				208	218			19						174
Ontario		203		220	230	241		31						186
Riverside		216		233	243	254		44	35					199
Murrieta				250	260			61						216
Escondido				268	278			79						234
San Diego (Lindbergh)		262		291	297	300		98	81					253
Norwalk	173		176				211					189	207	
Anaheim	184		187				222					200	218	
Frequency (trains per hour)	1	2	1	1	1	1	1	1	1	1	1	1	1	1

Note: “|” indicates no station stop for indicated pattern.

Santa Fe Depot and UTC station dwell time is eliminated, travel times to the San Diego terminus decrease by eight minutes.

Intraregional Forecasting Process for San Diego County

Since the SANDAG regional travel model was unavailable at the time the high speed rail ridership and revenue model was developed, an elasticity approach was used to forecast intraregional ridership within San Diego County. Intraregional ridership in the San Diego area was originally estimated using a direct demand approach based on relationships derived for the SCAG region. Subsequent ridership figures were estimated using elasticity analyses based on changes in level of service and fares.

Past applications of this approach have been straightforward due to fixed station locations at Escondido, University City (UTC), and San Diego (Santa Fe Depot). The alternative scenarios described herein have required some adjustments to existing procedures to account for differences in station locations and operating plans, as follows:

- *Qualcomm Terminus Scenario.* High speed rail mode shares for a similarly served station under base conditions (University City) were used to estimate intraregional trips for areas within two miles of the Qualcomm station. Since the areas served by the University City and San Diego (Santa Fe Depot) stations remained accessible via Trolley or bus service, ridership to those locations was estimated using the elasticity approach used for previous scenarios. The MTS Online Trip Planner was used to estimate increases in travel times to those former stations using public transit.
- *Lindbergh Terminus Scenarios.* Unlike the Qualcomm scenario, the Lindbergh station is sufficiently close to Santa Fe Depot and adjacent to a San Diego Trolley station. Therefore, Lindbergh station ridership could be estimated using only the standard elasticity analysis, accounting for differences in travel times and costs between the San Diego (Santa Fe Depot) in the *Increased Parking Cost Scenario* and the Lindbergh Station in the *Lindbergh Terminus Scenario* and *Lindbergh Terminus without UTC Scenario*.

2030 Full System Ridership and Revenue Results

Qualcomm Terminus Scenario

The 2030 Full System forecast for this scenario resulted in a predicted annual high-speed rail ridership of 95.2 million (see Table 4). This value represents an increase of 1.5 million (1.6 percent) compared to the May 2009 operating plan. This rise is attributable to interregional travel increases of about 2 percent. The greatest positive change in interregional riders occurs in the LA Basin-San Diego (7 percent) and San Diego-Bay Area (5 percent) markets.

Table 4. 2030 Full System Annual Region-to-Region Ridership and Revenue, San Diego Station Alternatives

Market	Increased Parking Cost Scenario				Qualcomm Terminus Scenario				Lindbergh Terminus Scenario				Lindbergh Terminus w/out UTC Scenario			
	HSR Ridership (Millions)	HSR Mode Share	HSR Avg. Fare (2008 Dollars)	Revenue (2008 Dollars in Millions)	HSR Ridership (Millions)	HSR Mode Share	HSR Avg. Fare (2008 Dollars)	Revenue (2008 Dollars in Millions)	HSR Ridership (Millions)	HSR Mode Share	HSR Avg. Fare (2008 Dollars)	Revenue (2008 Dollars in Millions)	HSR Ridership (Millions)	HSR Mode Share	HSR Avg. Fare (2008 Dollars)	Revenue (2008 Dollars in Millions)
LA Basin – Sacramento	3.8	50%	\$66	\$249	3.8	50%	\$66	\$250	3.8	50%	\$66	\$251	3.8	50%	\$66	\$250
LA Basin – San Diego	20.8	15%	\$31	\$637	22.3	16%	\$30	\$664	21.3	15%	\$31	\$652	21.6	15%	\$31	\$663
LA Basin- Bay Area	12.2	59%	\$68	\$827	12.2	59%	\$68	\$824	12.2	59%	\$68	\$829	12.2	59%	\$68	\$828
Sacramento – Bay Area	2.8	4%	\$45	\$127	2.9	4%	\$45	\$128	2.8	4%	\$45	\$127	2.8	4%	\$45	\$127
San Diego- Sacramento	0.1	4%	\$77	\$7	0.1	4%	\$77	\$6	0.1	4%	\$78	\$7	0.1	4%	\$78	\$6
San Diego- Bay Area	3.4	38%	\$81	\$274	3.6	40%	\$80	\$285	3.4	38%	\$81	\$277	3.4	38%	\$81	\$277
Bay Area – San Joaquin Valley	7.8	11%	\$45	\$354	7.8	11%	\$45	\$354	7.8	11%	\$45	\$354	7.8	11%	\$45	\$354
San Joaquin Valley – LA Basin	8.2	11%	\$44	\$360	8.2	11%	\$44	\$362	8.1	11%	\$44	\$360	8.2	11%	\$44	\$361
Sacramento – San Joaquin Valley	2.0	9%	\$43	\$86	2.0	9%	\$43	\$86	2.0	9%	\$43	\$86	2.0	9%	\$43	\$86
San Diego – San Joaquin Valley	0.1	27%	\$56	\$5	0.1	29%	\$55	\$5	0.1	27%	\$56	\$5	0.1	29%	\$56	\$5
Within Bay Area Peninsula	6.5	0.1%	\$11	\$71	6.5	0.1%	\$11	\$71	6.5	0.1%	\$11	\$71	6.5	0.1%	\$11	\$71
Within North LA Basin	5.0	0.1%	\$12	\$61	5.0	0.1%	\$12	\$61	5.0	0.1%	\$12	\$61	5.0	0.1%	\$12	\$61
Within South LA Basin	2.9	0.0%	\$10	\$30	2.9	0.0%	\$10	\$30	2.9	0.0%	\$10	\$30	2.9	0.0%	\$10	\$30
North LA – South LA	5.5	0.2%	\$11	\$61	5.5	0.2%	\$11	\$61	5.5	0.2%	\$11	\$61	5.5	0.2%	\$11	\$61
Within San Diego region	0.3	0.0%	\$11	\$3	0.1	0.0%	\$10	\$1	0.3	0.0%	\$10	\$3	0.2	0.0%	\$11	\$2
Within San Joaquin Valley*	2.1	0.0%	\$29	\$62	2.1	0.0%	\$29	\$62	2.1	0.0%	\$29	\$62	2.1	0.0%	\$29	\$62
Other *	10.3	0.1%	\$53	\$547	10.4	0.1%	\$53	\$548	10.3	0.1%	\$53	\$546	10.3	0.1%	\$53	\$546
Total	93.7	0.2%	\$40	\$3,763	95.2	0.2%	\$40	\$3,798	94.3	0.2%	\$40	\$3,780	94.4	0.2%	\$40	\$3,791
Within San Diego Region	0.3	0.0%	\$11	\$3	0.1	0.0%	\$10	\$1	0.3	0.0%	\$10	\$3	0.2	0.0%	\$11	\$2
Within Entire LA Basin	13.3	0.0%	\$11	\$153	13.3	0.0%	\$11	\$153	13.3	0.0%	\$11	\$153	13.3	0.0%	\$11	\$153
Within Entire MTC	6.5	0.0%	\$11	\$71	6.5	0.0%	\$11	\$71	6.5	0.0%	\$11	\$71	6.5	0.0%	\$11	\$71
Total Between Regions	73.6	8.1%	\$48	\$3,536	75.3	8.3%	\$47	\$3,574	74.2	8.2%	\$48	\$3,555	74.5	8.2%	\$48	\$3,567

* "W/in San Joaquin Valley" and "Other" markets include interregional and intraregional travel.

Intraregional trips for San Diego County decline by about 60 percent, which can be explained by two factors. First, removing UTC and Santa Fe Depot stations results in less HSR connectivity within the region; therefore, other transit systems would be needed to transfer to intraregional destinations, increasing fares and travel times. Another likely factor for the intraregional decline is that the population density adjacent to Qualcomm station is lower than at UTC and Santa Fe Depot.

Increases in market-to-market ridership translate to a \$35-million (1-percent) overall rise in system revenues. Interregional total revenue increases by \$38 million (1.1 percent), and the individual market with the largest increase in revenues is LA Basin-San Diego, which rises by \$27 million (4 percent). Within San Diego County, revenue decreases by roughly \$2 million (60 percent).

Table 5 presents the average daily boardings at each high-speed rail station. In the *Qualcomm Terminus Scenario*, average daily boardings increase by 4,000 (1.5 percent) over the May 2009 operating plan. Interregional daily boardings at San Diego County stations increase by 2,280 compared to the May 2009 operating plan. The majority of new trips travel between San Diego County and the LA Basin. Daily station-to-station line loads in this area increase by 5 to 6 percent (see Table 6). Other station-to-station line loads show no increase of more than 1 percent.

Lindbergh Terminus Scenario

The 2030 Full System *Lindbergh Terminus Scenario* resulted in predicted annual high-speed rail ridership of 94.3 million (see Table 4), an increase of 0.6 million (less than 1 percent) compared to the May 2009 operating plan. This increase is attributed to interregional travel increases of about 1 percent overall with the most significant change in the LA Basin-San Diego market (2.6 percent), followed by the San Diego-Bay Area market with a slight increase in ridership (1.3 percent). Intraregional trips for San Diego County decrease by about 20 percent, overall. As in the *Qualcomm Terminus Scenario*, this decrease can be explained due to the higher fares and travel times associated with utilizing other transit systems to transfer to intraregional destinations.

Increases in market-to-market ridership translate to roughly a \$17 million (0.5 percent) rise in system revenues over the May 2009 operating plan. Interregional total revenue increases by approximately \$19 million (1.1 percent). Again, the individual market with the largest increase in revenues is LA Basin-San Diego, which rises by \$15 million (2.6 percent), followed by the San Diego-Bay Area market with a slight increase in ridership of \$3 million (1.2 percent). Intraregional revenue for San Diego County decreases by less than \$1 million (20 percent).

Overall, average daily boardings increase by 1,100, or 0.4 percent (see Table 5). San Diego County stations gain about 800 daily interregional trips over the May 2009 operating plan. The Lindbergh station attracts 860 more daily interregional boardings than Santa Fe Depot. Daily station-to-station line loads between the San Diego area and the LA Basin increase by 1 to 2 percent (see Table 6). Other station-to-station loads on the corridor show no significant change.

Table 5 Full System Average Daily HSR Stations Boardings, San Diego Station Alternatives

Origin Station	Increased Parking Cost Scenario	Qualcomm Terminus Scenario	Lindbergh Terminus Scenario	Lindbergh Terminus w/out UTC Scenario
San Francisco (Transbay)	34,500	34,600	34,600	34,500
Millbrae	5,700	5,700	5,700	5,700
Redwood City	7,500	7,500	7,500	7,500
San Jose	12,100	12,100	12,100	12,000
Gilroy	6,500	6,400	6,400	6,500
Sacramento	18,100	18,100	18,100	18,100
Stockton	6,300	6,400	6,300	6,300
Modesto/SP Downtown	4,400	4,400	4,300	4,300
Merced	2,500	2,500	2,500	2,500
Fresno	8,000	8,000	7,900	8,000
Bakersfield	8,100	8,100	8,100	8,100
Palmdale	16,400	16,500	16,400	16,400
Sylmar	12,900	13,000	12,900	12,900
Burbank	4,100	4,200	4,100	4,100
Los Angeles (Union)	28,100	28,700	28,200	28,200
Norwalk	6,800	6,800	6,800	6,800
Anaheim	21,700	22,300	21,800	22,000
City of Industry	6,400	6,700	6,500	6,500
Ontario	10,600	10,700	10,600	10,700
Riverside	13,700	13,700	13,900	14,000
Temecula/Murrieta	7,100	7,200	7,100	7,100
Escondido	7,800	8,200	7,800	8,300
University City (UTC)	5,900		5,800	
San Diego (Qualcomm)		26,400		
San Diego (Lindbergh)			19,900	25,200
San Diego (Santa Fe Depot)	19,200			
Daily	274,100	278,100	275,500	276,000

Table 6 Year 2030 Full System Daily Line Loads, San Diego Station Alternatives

Origin Station	Destination Station	Increased Parking Cost Scenario	Qualcomm Terminus Scenario	Lindbergh Terminus Scenario	Lindbergh Terminus Without UTC Scenario
San Francisco (Transbay)	Millbrae	34,500	34,600	34,600	34,500
Millbrae	Redwood City	32,400	32,500	32,500	32,500
Redwood City	San Jose	34,400	34,500	34,400	34,500
San Jose	Gilroy	39,200	39,400	39,300	39,300
Gilroy	Merced	6,100	6,100	6,100	6,000
Gilroy	Fresno	33,700	33,900	33,800	33,800
Sacramento	Stockton	18,100	18,100	18,100	18,100
Stockton	Modesto/ SP Downtown	23,700	23,800	23,800	23,700
Modesto	Merced	26,700	26,700	26,700	26,600
Merced	Fresno	22,200	22,200	22,200	22,200
Fresno	Bakersfield	53,000	53,200	53,100	53,100
Bakersfield	Palmdale	49,100	49,300	49,200	49,200
Palmdale	Sylmar	55,900	56,200	56,000	56,000
Sylmar	Burbank	53,300	53,800	53,500	53,500
Burbank	Los Angeles (Union)	51,900	52,400	52,000	52,000
Los Angeles (Union)	Norwalk	25,100	25,800	25,400	25,500
Norwalk	Anaheim	21,700	22,200	21,800	22,000
Los Angeles (Union)	City of Industry	37,500	39,400	38,000	38,200
City of Industry	Ontario	39,800	41,900	40,400	40,600
Ontario	Riverside	39,700	42,000	40,400	40,700
Riverside	Temecula/ Murrieta	36,200	38,400	37,000	37,400
Temecula/Murrieta	Escondido	32,000	34,200	32,800	33,100
Escondido	San Diego (Qualcomm)		26,400		
Escondido	University City (UTC)	24,700		25,400	25,200
University City (UTC)	San Diego (Lindbergh or Downtown)	19,200		19,900	25,200

Lindbergh Terminus without UTC Scenario

The 2030 forecast for this scenario resulted in a predicted annual high-speed rail ridership of 94.4 million, an increase of 0.7 million (0.7 percent) compared to the *Increased Parking Cost Scenario* (see Table 4). This increase is attributed to interregional travel increases of about 1 percent. The greatest change in interregional riders occurs in the LA Basin-San Diego market (4 percent).

Intraregional trips for the San Diego region decline by 50 percent. As in the other station alternatives, this can be attributed to lower HSR connectivity in the region and the increased transfers, fares, and travel times associated with accessing intraregional destinations via alternative transit systems.

Increases in market-to-market ridership translate to a \$28 million (0.7 percent) overall rise in system revenues. Interregional revenue increases by approximately \$31 million (0.9 percent). The individual market with the largest increase in revenues is LA Basin-San Diego, which rises by \$26 million (4 percent). Within the San Diego region, revenue decreases by approximately \$1 million (30 percent).

Overall, average daily boardings increase by 1,900 (0.7 percent) over the May 2009 operating plan (see Table 5). Interregional daily line loads in San Diego County increase by 1,770 (see Table 6). Daily line loads increase between 1.5 to 3.4 percent between the San Diego area and the LA Basin. Other station-to-station line loads show no significant change.

Station Catchment Areas

Figures 2 to 5 show catchment areas for the May 2009 operating plan and the three alternative station configurations in San Diego County. These indicate that the San Diego terminus alternative, whether at Qualcomm or Lindbergh Field, becomes the preferred destination for passengers traveling to/from the University City area when the UTC stop is eliminated. The UTC station appears to offer a convenient alternative to those with origins/destinations in the immediate vicinity of University City, but as station boarding data will reveal, the San Diego terminus typically captures the majority of these trips when a UTC stop is not present.

Analysis

Overall, these results suggest that at the system level, any of the three described scenarios may generate slightly more ridership and revenue than the *Increased Parking Cost Scenario*. Relocating the San Diego terminus from Santa Fe Depot to either Qualcomm Stadium or Lindbergh Field would result in slight increases in overall ridership and revenue.

Of the three scenarios, the Qualcomm terminus would provide the greatest increase in overall ridership as well as interregional trips, although it would also have the most negative impact on intraregional ridership in the San Diego region due to the removal of the University City (UTC) station. Of the two Lindbergh Field terminus scenarios, the one that retains the UTC stop provides the smallest overall gain in ridership and the smallest reduction in intraregional ridership compared to the *Increased Parking Cost Scenario*.

Figure 2. May 2009 Operating Plan Catchment Areas



Based on these model results, it would appear that due to direct service and shorter travel times to Qualcomm Stadium, interregional travelers along the southern corridor would find HSR to be a more convenient means of accessing this destination, thereby increasing interregional ridership enough to offset the loss in intraregional trips. It also appears that a terminus at Lindbergh Field would be most competitive with a Qualcomm Stadium location if the UTC stop is removed.

Additional Note

The information and results presented in this memorandum are estimates and projections that involve subjective judgments, and may differ materially from the actual future ridership and revenue. This memorandum is not intended nor shall it be construed to constitute a guarantee, promise or representation of any particular outcome(s) or result(s). Further, the material presented in this memorandum is provided for purposes of supporting high speed rail planning-level analyses, and is intended to assist in identifying relative differences between potential alignment and station alternatives.

Figure 3. Qualcomm Terminus Scenario Catchment Areas

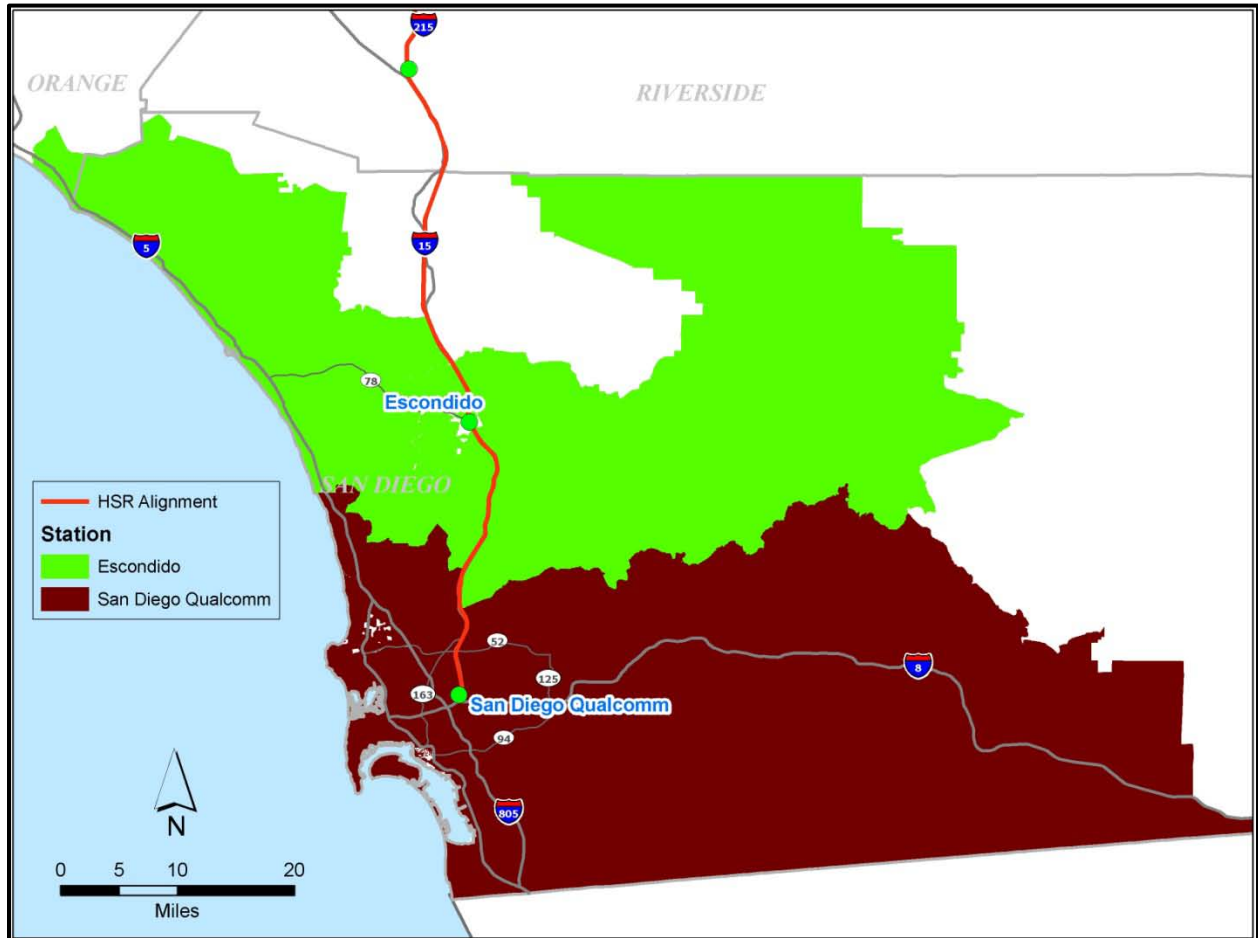


Figure 4. Lindbergh Station Scenario Catchment Areas

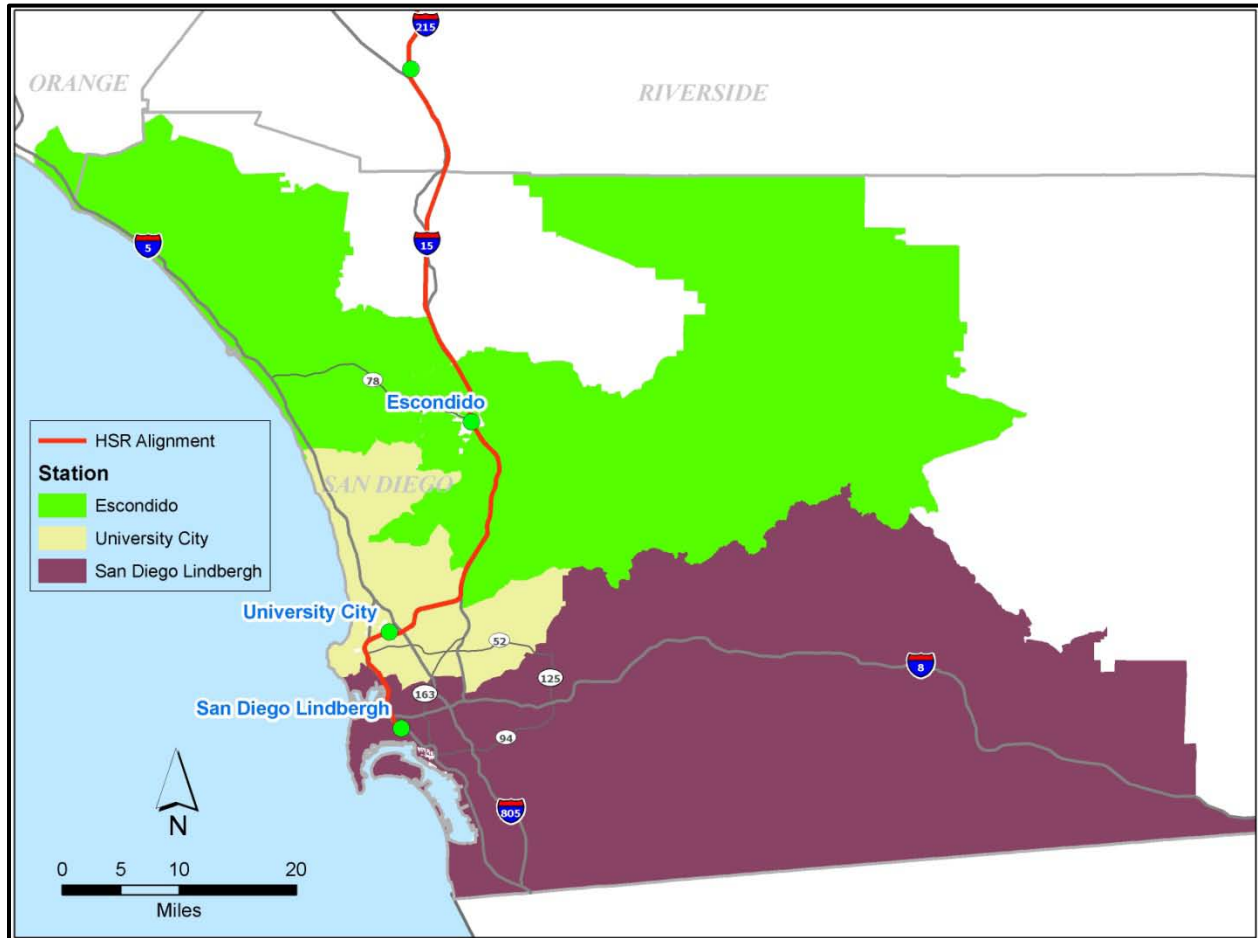


Figure 5. Lindbergh Without UTC Scenario Catchment Areas

